21-M
1956

MAINTENANCE INSTRUCTIONS

MEG® TYPE
HAND OPERATED

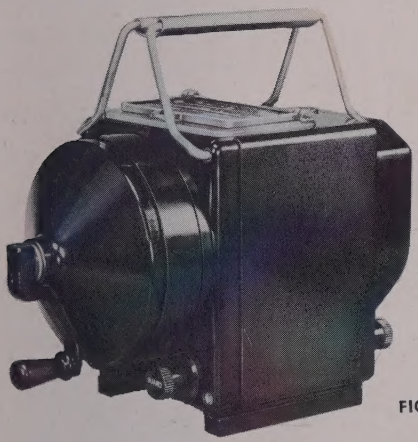


FIGURE 1

MEGGER® INSULATION TESTER

JAMES G. BIDDLE CO.
1316 Arch Street, Philadelphia 7, Pa.

SECTION **A:**

Introduction

The information in this manual applies to the Meg type of Megger insulation testers—with molded plastic cases and hand-cranked generator.

There are two basic types of instruments:

1. Variable voltage—250 and 500 volts. Figure 2.
2. Constant voltage—250, 500 and 1000 volts. Figure 3.

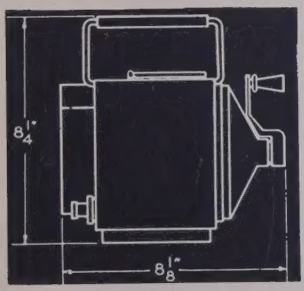


FIGURE 2
Variable voltage

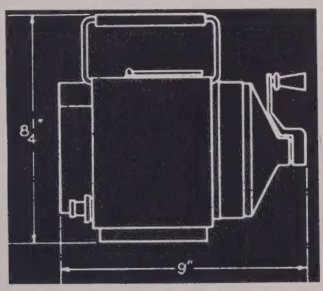


FIGURE 3
Constant voltage

Additional features for increasing the usefulness of these instruments are available.

The selector switch is located on the side of the instrument. Following are the various switches supplied:

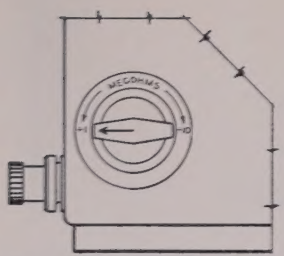


FIGURE 4. Megohm scale with divide-by-1 and 10 switch (the A switch), ONE SCALE.

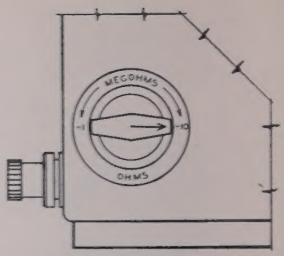


FIGURE 5. Megohm scale with divide-by-1 and 10, and ohm scale (the AR switch), TWO SCALES.

The switches shown in Figures 4, 5 and 6 can be on variable or constant voltage instruments.

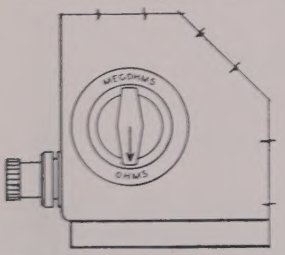


FIGURE 6. Megohm and ohm scales (the R switch), TWO SCALES.

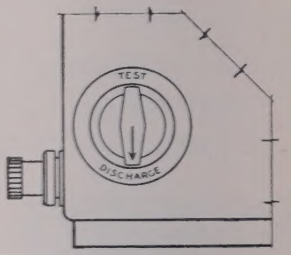


FIGURE 7. Megohm scale and capacitance discharge switch (the K switch), ONE SCALE.

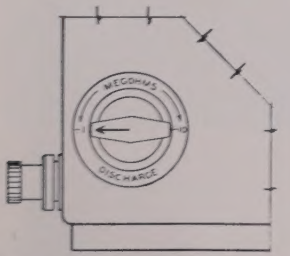


FIGURE 8. Megohm scale with divide-by-1 and 10 and discharge switch (the AK switch), ONE SCALE.

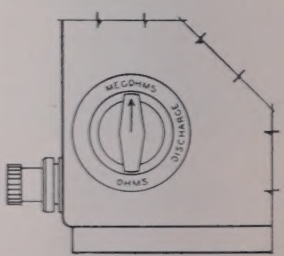


FIGURE 9. Megohm scale, ohm scale and discharge switch (the RK switch), TWO SCALES.

The switches shown in Figures 7, 8 and 9 are on constant voltage instruments only.

SECTION **B:**

Basic Wiring Diagrams

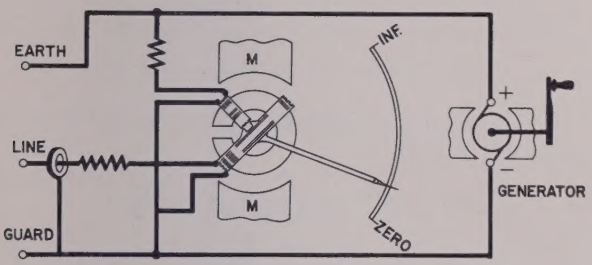


FIGURE 10. Showing the guard terminal, found on all instruments having ohm scales and readings over 200 megohms.

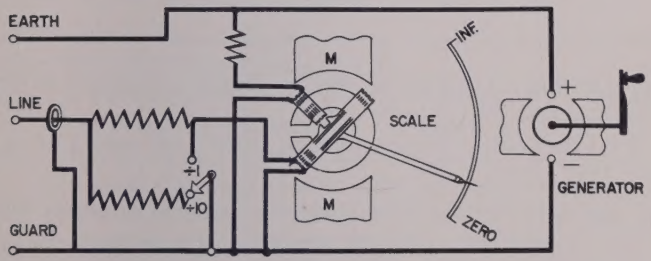


FIGURE 11. Wiring diagram showing the A switch.

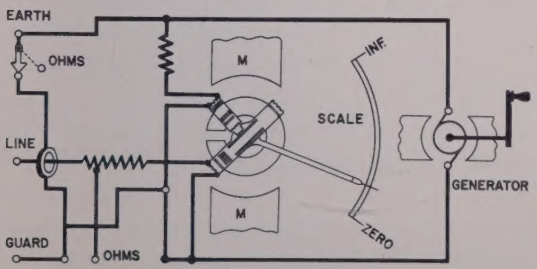


FIGURE 12. Wiring diagram showing the R switch.

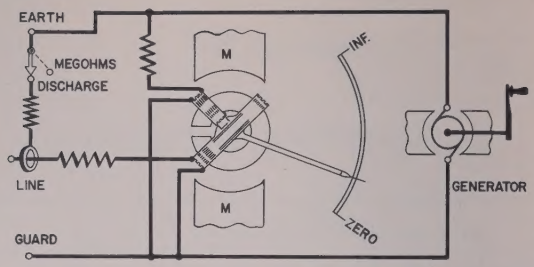


FIGURE 13. Wiring diagram showing the K switch.

The AR, AK and RK switches are combinations of those shown in Figures 11, 12 and 13.

SECTION C:

Routine Checking

The procedure for checking Meg type Megger insulation testers, *before making tests,* is as follows:

On instruments having a selector switch—set switch to ÷ 1 or ÷ 10.

1. *Checking Infinity:* (For constant voltage instruments) With no connections to the test terminals, turn crank, increasing speed until clutch is felt slipping (at about 160 rpm). The pointer should move promptly to INFINITY.
2. *Checking Infinity:* (For variable voltage instruments) Same as C-1, except that cranking speed of 160 rpm must be approximated.
3. *Checking Zero:* Short circuit EARTH and LINE terminals, then turn the crank and the pointer should move promptly to ZERO.
4. *Checking Test Leads:* Test leads play an important part in the operation of and the results obtained from an instrument. Insulated, single conductor, stranded test leads are recom-

mended. With leads connected to the instrument terminals, and opposite ends separated, turn the crank at normal speed —the pointer should read INFINITY. If not, there is a leak between leads, which must be corrected before proceeding with test.

To make certain that the leads are not open-circuited, connect the *test ends* of the leads together and turn the crank, the pointer should move to ZERO.

SECTION D:

Shop Inspection

Shop inspection and maintenance should be performed only by qualified persons in a properly equipped shop or laboratory.

1. *Checking Scale*
   (a) Constant Voltage Instruments
   Connect the EARTH and LINE terminals to known resistances. Turn crank at slip speed and read scale, noting any deviation between the known resistance values and the values shown on the scale of the instrument. The pointer should indicate within ± 1.0 per cent of the scale length, approximately ± .03″.
   (b) Variable Voltage Instruments
   Proceed as in (a) except that the cranking speed of 160 rpm must be approximated.
2. *Points to Check on Scale*
   The points to check should not be held fast to any particular values. If the scale checks at ZERO, at one point mid-scale, and at INFINITY, it would, in all likelihood, check correct at all other points.
3. *Voltage Test of Generator Output*
   (a) Constant Voltage Instruments
   Connect the EARTH and LINE terminals to an elec-

trostatic voltmeter of sufficient range to exceed the voltage rating of the instrument. Crank at slip speed and observe voltage. The voltmeter should read between 500 and 525 volts. The Megger ohmmeter is a permanent magnet, cross-coil, indicating instrument. Its accuracy is independent of the exact voltage supplied for the test. If the voltage is found to be low (in the order of 5% or 475 volts), adjustments to output voltage can be made. (See Section E, item 13).

(b) Variable Voltage Instruments
Crank at approximately 160 rpm. If voltage is, say 5%, below normal voltage rating, increase cranking speed until correct voltage is obtained. If excessive cranking speed (about 200 rpm) is necessary, see Section E, item 13.

NOTE: *Maximum cranking speed for test of generator output of constant or variable voltage instruments is 200 rpm.*

If a moving coil voltmeter is used instead of an electrostatic voltmeter, the resistance should be made for the voltage drop due to the internal resistance of the instrument being checked.

4. *Checking Ohm Scale*
Set switch to OHMS and connect GUARD and OHM terminals to known resistances. The pointer should indicate ± 1.5 per cent of full scale deflection — approximately ±.040".

5. *Points to Check on Ohm Scale*
The scale may be checked at various points and, if readings are correct, other points will check as well. Zero, 10, 100 and 1000 ohms are suggested as satisfactory check points.

6. *Capacitance Discharge Switch*
Set switch at DISCHARGE and, with no connections to the test terminals, turn the crank at slip speed (160 rpm) and read scale. The reading should be approximately 5000—10,000 ohms.

If the instrument checks satisfactorily for each of the foregoing instructions, that are applicable, it can be considered as suitable for use. If it is in error, follow instructions in Section C.

SECTION E:

Maintenance Procedure

IMPORTANT—In opening the Meg type of Megger insulation tester observe carefully how parts are removed, what they are, and in what order they're taken out. Place all these parts in a dust-free box. Be particularly watchful for metallic particles such as filings or slivers which may collect on the moving system magnet, thus closing the air gap and causing a sticking action of the pointer. A needle may be used to collect such particles of metal but be extremely careful that the moving system is not damaged in the process.

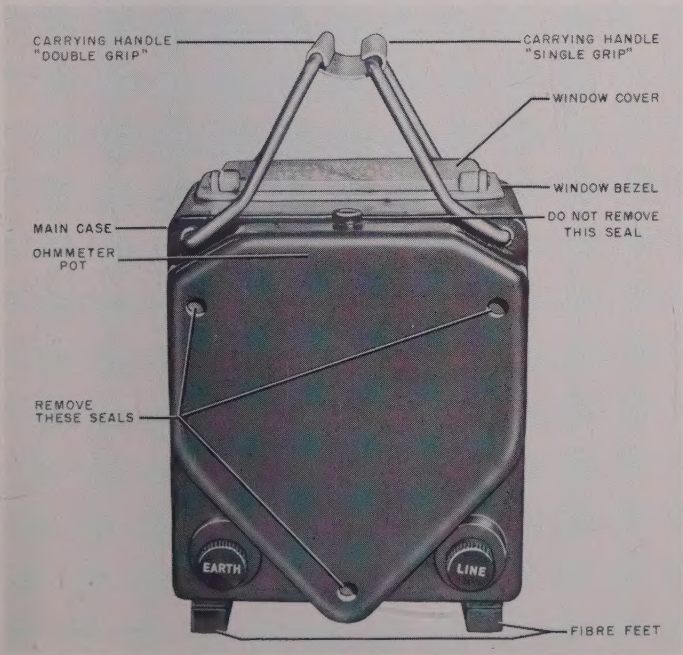


FIGURE 14

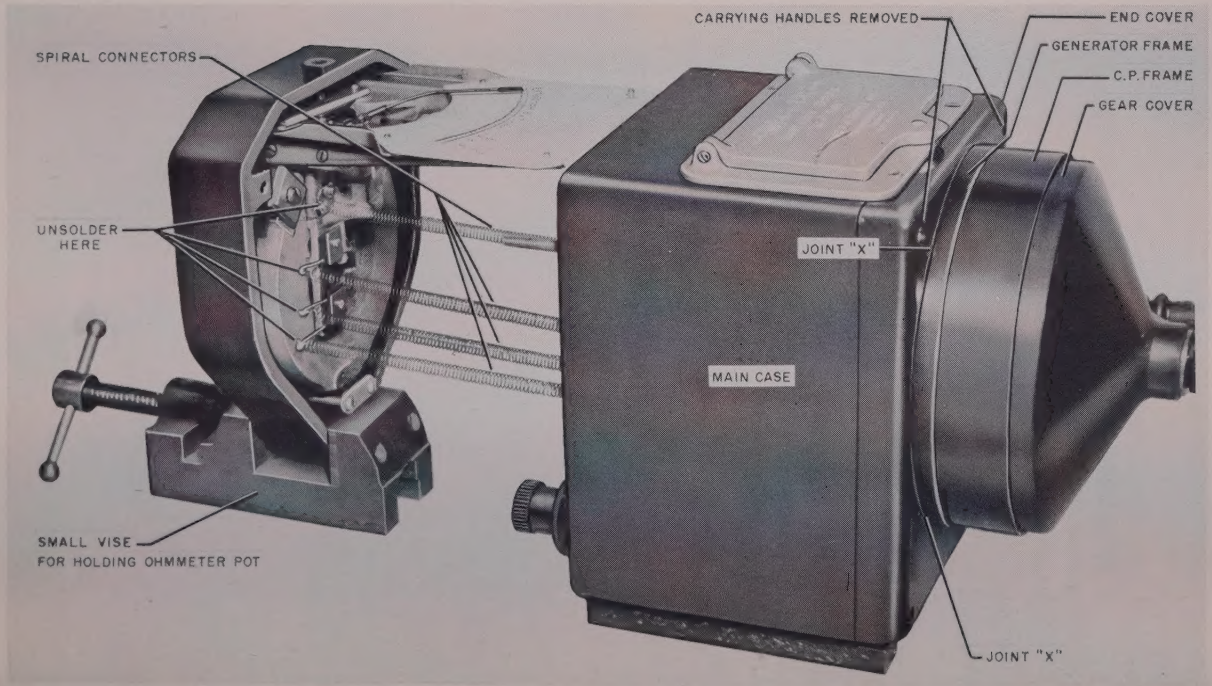

CARRYING HANDLES REMOVED
END COVER
GENERATOR FRAME
C.P. FRAME
GEAR COVER
SPIRAL CONNECTORS
UNSOLDER HERE
JOINT "X"
MAIN CASE
SMALL VISE FOR HOLDING OHMMETER POT
JOINT "X"

FIGURE 15

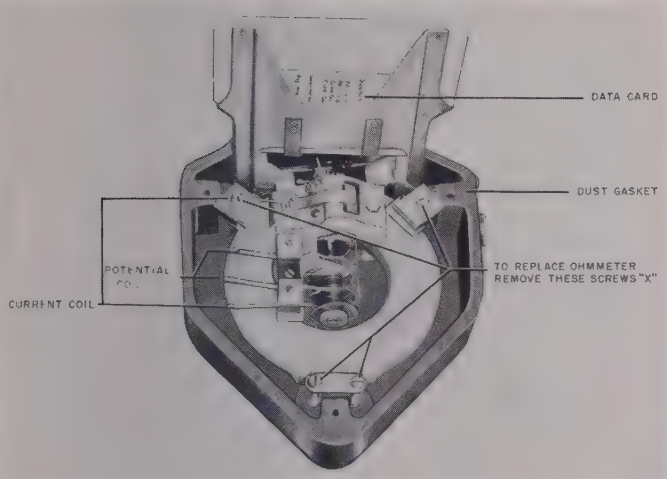


FIGURE 16

To avoid difficulty, open the instrument in a metallic-dust-free room.

1. Remove the three lead seals in the ohmmeter pot at the end opposite the generator crank—a small screw-driver will accomplish this. It is not necessary to remove the seal on the top of the ohmmeter pot.
2. Remove the three screws with a split-type screwdriver.
3. Pull the ohmmeter away from the instrument—keeping it parallel—and no further from it than 3″ or 4″.

NOTE: This is a high range instrument having 4 spiral connectors. Older, low range instruments without switches have only 3 spiral connectors.

4. Remove solder from spiral connector, holding with tweezer, then gently return over guide pin on spiral connector bracket.
5. At this point, after the 4 preceding steps, the moving system can be inspected, i.e., current coil potential coil, ligaments and magnet. A low voltage ohmmeter can be used to check the continuity and resistance of the current or deflecting coil, and the potential or control coil of the Megger instrument.

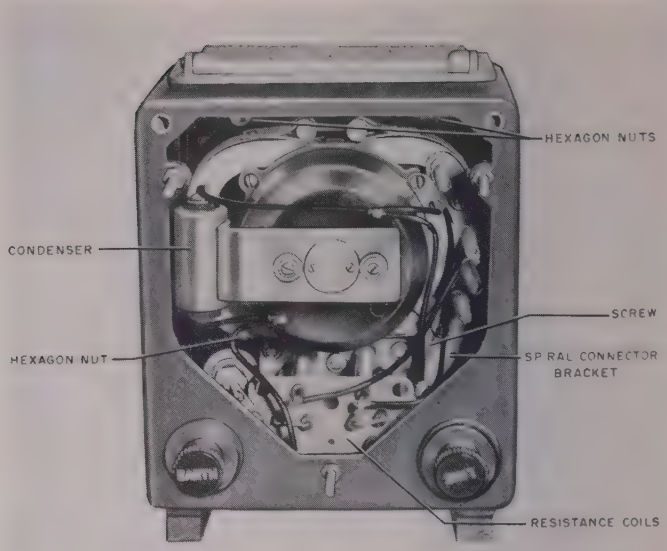


FIGURE 17

If one of the coils of the moving system is found to be defective, the moving system should be replaced (without attempting repairs) with a complete new calibrated system of the same type.

To remove ohmmeter pot remove screws "x", Figure 16.

Resistance values shown on data card are for normal room temperatures. If readings are taken at different temperatures, corrections must be made.

6. Check resistance coils in bottom of instrument case. Unsolder and disconnect the two connections to the spiral connector bracket. A high-range ohmmeter or Wheatstone bridge can be used. If a resistor must be replaced, any type of equivalent resistance can be used in an emergency, remembering that the coils should be able to dissipate the required wattage. Resistance coils should agree with values shown on the data card, within $\pm$ 1%.
7. Check binding posts. Line and ohms terminals are guarded from the case.

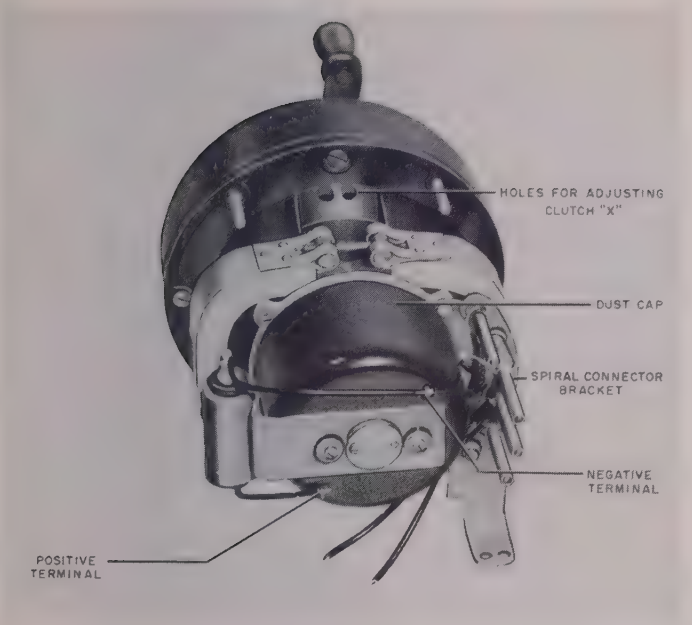


FIGURE 18

8. To remove the generator (See Figures 17 and 18).

   Unsolder all connections to the generator, including two wires from resistor coils to spiral connector bracket.

   Remove the condenser mounted on the end of the generator. Do not lose the insulating washers.

   Remove the four hexagon nuts holding the generator to the case. Instruments with a switch have 3 hexagon nuts and 1 screw holding the generator. (Special hexagon wrench with long handle required.)

   Draw the generator assembly from the crank end. It may be necessary to use a knife blade to break the cement joint (see Figure 15—joint "X").
9. To remove plastic dust cap on generator.
   Straighten the wires that project through the hole in the dust cap—then pull off the dust cap.
10. Check brushes sticking.

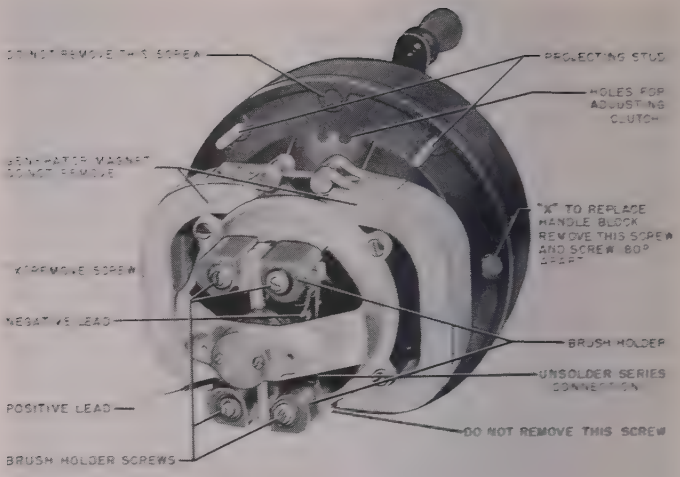

DO NOT REMOVE THIS SCREW
PROJECTING STUD
HOLES FOR ADJUSTING CLUTCH
GENERATOR MAGNET DO NOT REMOVE
"X" TO REPLACE HANDLE BLOCK REMOVE THIS SCREW AND SCREW BOP SHAFT
X REMOVE SCREW
NEGATIVE LEAD
BRUSH HOLDER
UNSOLDER SERIES CONNECTION
POSITIVE LEAD
DO NOT REMOVE THIS SCREW
BRUSH HOLDER SCREWS

FIGURE 19

Use a needle or fine pointed instrument. Make sure that no carbon or carbon dust is adhering to the brush housing.

11. To remove brush holders.
    Remove only if necessary. Unsolder series connection and remove the two screws holding them.
12. Check armature for continuity and resistance.
    Resistance of armature shown on data card is approximate for room temperature and is for both sections. Do not remove generator magnets.
13. If generator voltage is low:
    Adjustment of the two clutch screws may be necessary to increase voltage. See Figures 18, 19 and 20.
    Procedure with constant voltage instruments:
    (a) Turn armature by hand until screw head can be seen through opening marked "X", Figure 18.
    (b) While holding armature, insert a small screwdriver in the opening and turn the adjusting screw clockwise a half turn—it will click into position.
    (c) Turn armature 180° and repeat on the second screw. The adjustment must be equal on each screw in order to equalize the tension on the clutch.

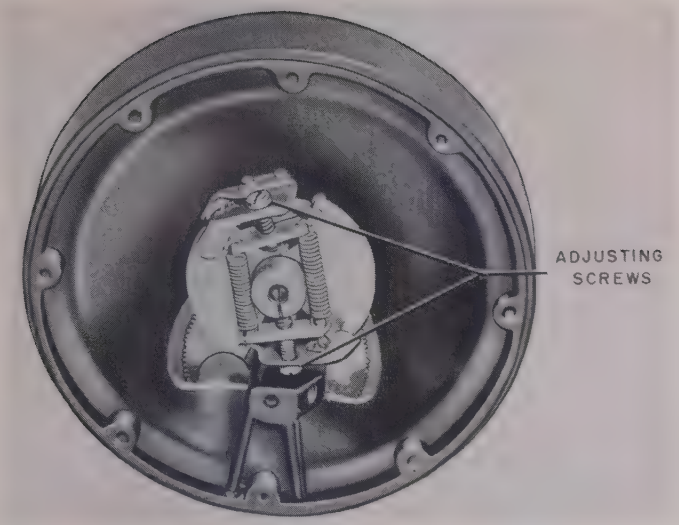


FIGURE 20

(d) Check voltage by placing equivalent ballast potential resistance (as shown on data card) in parallel with the generator and electrostatic voltmeter. This is equivalent to the normal potential ballast resistance of the instrument.

14. Gears and bearings
Since these are packed in grease for the life of the instrument it shouldn't be necessary to replace them.

15. Handle driving block
If replacement is necessary proceed as follows:
(a) Remove screws marked "X" only. See Figure 19.
(b) Using a hide mallet, tap the projecting studs gently and withdraw the gear cover.
(c) Remove the two screws holding the crank handle to the driving block. See Figure 21.
(d) Knock out the steel pin with a suitable pin punch.
(e) When fitting new handle block, hold the drive shaft rigid so that the holes in the shaft and handle block will line up. Replace pin and handle.

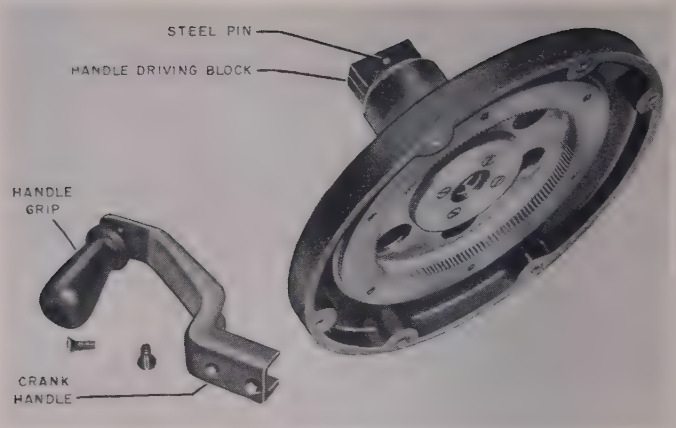


FIGURE 21

(f) Replace the gear cover carefully avoiding damage to the gears and replace screws.

16. Window glass over scale

To replace glass proceed as in E 1, 2, 3 and 4, being careful to remove all broken glass, gasket, or putty particles from inside the instrument.

(a) Remove the four screws holding the bezel.

(b) Cut glass to fit or use window glass, part number 23464 and gaskets, part numbers 6096 and 6097.

SECTION F:

Replacement Parts List

Particular care should be used in ordering parts. List part numbers correctly and note:

(1) whether the instrument is constant or variable voltage

(2) does the instrument have a switch

(3) list along with the part number the voltage, range, and serial number of the instrument.

NOTE: *Parts for aluminum case instruments can be secured by writing "Aluminum Case" after the part number.*

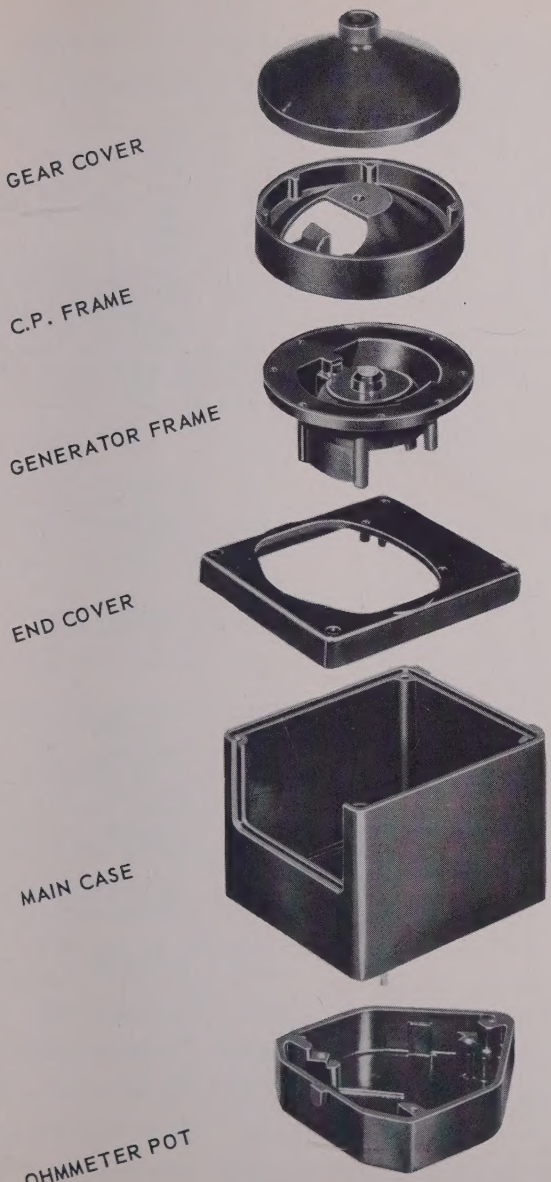


FIGURE 22. Constant voltage instrument.

PART NAME	PART NO.	NOTE
Ohmmeter Pot (Ohmmeter End Cover)	X-1099	Same for all types of instruments.
Conical Nuts for securing ohmmeter pot to Main Case	Z-281	3 required per instrument.
Main Case	1058-1	Without switch hole.
Main Case	1058-2	With switch hole.
End Cover, Main Case	1059-1	Earth & Line Terminal instrument.
End Cover, Main Case	1059-2	Earth, Line & Guard Terminal instrument only.
End Cover, Main Case	1059-3	Earth, Line, Guard & Ohms Terminal instrument only.
Generator Frame	X-1114-2	Same for all types of instruments.
C. P. Frame	W-533	Constant Voltage instruments only.
Gear Cover with bushing	Y-725-A	Same for all types of instruments.

TO OBTAIN CORRECT MOVING SYSTEM IT IS NECESSARY TO LIST THE SERIAL NUMBER OF THE INSTRUMENT AND THE PREFIX — IF ANY.

Moving System complete with magnet and calibrated scale (less ohmmeter pot, Part #X-1099) Navy Type GC	6678-4	Instrument with and without prefix B in serial number.
Ditto. Navy Type GM	2678-5	Instrument with prefix B in serial number.
Moving System Complete with calibrated scale for ranges up to 200 megohms (less ohmmeter pot, Part #X-1099)	2678-4	Instruments without switches; prefix B in serial number.
Moving System Complete with calibrated scale for ranges up to 200 megohms (less ohmmeter pot, Part #X-1099)	2678-6	Instrument with switches; prefix B in serial number.
Ditto, for ranges up to 200 megohms	2678-1	Instruments with and without switches; prefix BS in serial number.
Ditto, for ranges over 200 megohms	2678-2	Instruments with and without switches; prefix BS in serial number.
Ditto, for ranges over 200 megohms	2678-5	Instruments with and without switches; prefix B in serial number.
Resistors		
Carbon Deposited Type	CP-2	Must state resistance value.
Wire Wound	1083	Must state resistance value.
Generator Complete		
250 Volt D-C Generator Unit Assembly	X-2682-2	For variable-voltage instruments.
500 Volt D-C Generator Unit Assembly	X-2682-4	For variable-voltage instruments.
250 Volt D-C Generator Unit Assembly	X-2681-2	For constant-voltage instruments.
500 Volt D-C Generator Unit Assembly	X-2681-4	For constant-voltage instruments.
1000 Volt D-C Generator Unit Assembly	X-2681-5	For constant-voltage instruments.
Capacitor		
250 Volt Instruments	RZ-4619-B	Same for all 250 volt instruments.
500 Volt Instruments	RZ-4619-C	Same for all 500 volt instruments.
1000 Volt Instruments	RZ-4619-D	Same for all 1000 volt instruments.

PART NAME	PART NO.	NOTE
Generator Dust Cap		
250 Volt Instruments	Z-16096	Same for all 250 volt instruments.
500 Volt Instruments	Z-16096	Same for all 500 volt instruments.
1000 Volt Instruments	Z-16710-A	Same for all 1000 volt instruments, with Potential Ballast resistance wound on same.
Ligament Assemblies		
3 Ligament Instruments	1175	Set 3 Ligaments.
4 Ligament Instruments	1176	Set 4 Ligaments.
Spiral Connector Spring (Spring connection)		
3 Ligament Instruments	Z-3473	3 required per instrument.
4 Ligament Instruments	Z-3473	4 required per instrument.
Binding Post (Terminal)		
Earth	1157	Complete.
Line	1156	Complete.
Guard	1158	Complete.
Ohms	1174	Complete.
Fibre foot	Z-3481	2 required per instrument.
Screws for fixing Fibre Feet	6S5308	4 required per instrument.
Handle driving block	Z-8048	
Steel Pin for Handle Driving Block	2717-3	
Crank handle with grip	Z-3439	
Screws for crank handle and grip	4S4205	2 required per instrument.
Carrying Handle—single wire	Y-683	
Carrying Handle—single wire and grip	Y-682	

NEXT FOUR (4) ITEMS SHOULD BE ORDERED TOGETHER.

Window cover lid with instructions	1107	To supply correct instructions it is necessary to list the serial number and prefix, either B or BS.
Window cover hinge screw	Z-3468	2 required per instrument.
Window bezel	1114	
Window bezel fixing screw	4B2405N	4 required per instrument.
Window bezel gasket	6096	Top—under bezel.
Window glass	Z-3464	
Window gasket	6097	Bottom under glass.
Brush holder complete with spring and carbon brushes	6120-1 (upper) 6120-2 (lower)	1 upper and 1 lower required.
Generator carbon brushes	Z-1276	4 required per instrument.
Generator brush springs	Z-1316A	4 required per instrument.

CARRYING CASES WITH STRAPS	CAT. NO.	
Fabrikoid	7697	For instrument only—no provisions for leads.
Leather	7692	For instrument only—no provisions for leads.
Fabrikoid	7699	For instrument with compartment for 12′ test leads, Cat. 963.
Leather	7694	For instrument with compartment for 12′ test leads, Cat. 963.

TESTING LEADS

12 feet long	963	1 Pair.
25 feet long	964	1 Pair.
50 feet long	965	1 Pair.

BIDDLE TESTING INSTRUMENTS

MEGGER INSULATION RESISTANCE TESTERS

FRAHM RESONANT REED FREQUENCY METERS & TACHOMETERS

"TTR" TRANSFORMER TURN RATIO TEST SET

BRIDGE-MEG

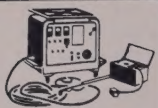
MEGGER LOW RESISTANCE OHMMETER

MIDGET MEGGER CIRCUIT TESTING OHMMETER

DUCTER

JAGABI TACHOSCOPE

JAGABI TACHOMETERS & SPEED INDICATORS



BIDDLE IMPULSE CABLE FAULT LOCATOR

MEG-TYPE MEGGER INSULATION TESTER

APIEZON OILS • GREASES • WAXES

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